

Having described my invention, what I claim as new and desire to  
secure by Letters Patent is:

1           1. An exercise apparatus comprising a frame having a  
2           predetermined reference position, an engagement assembly for use by an operator  
3           during exercise and means for resisting movement of the engagement assembly by  
4           the operator during said exercise.

1           2. The exercise apparatus of claim 1 including means mounting said  
2           engagement assembly for selective movement along a path of travel relative to said  
3           reference position for purposes of controlling the exercise of said operator positioned  
4           relative to said reference position.

1           3. The apparatus of claim 2 wherein said engagement assembly is  
2           mounted for movement along a second path of travel for use in exercising.

1           4. The apparatus of claim 3 wherein said resisting means resists  
2           movement of the engagement assembly along said second path of travel during said  
3           exercising.

1           5. The apparatus of claim 2 including an operator's station adapted  
2           to receive said operator in substantial coincidence with said reference position for  
3           contact by the operator during said exercising.

1           6. The apparatus of claim 5 wherein said path of travel is an arc  
2           substantially concentric to said reference position.

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1           7. The apparatus of claim 6 wherein said reference position is  
2           substantially coincident with the shoulders of said operator in the operator's station.

1           8. The apparatus of claim 5 wherein said mounting means includes  
2           a track defining said path of travel and a carriage borne by said track for movement  
3           along said path of travel and mounting said engagement assembly for said movement  
4           along the path of travel whereby said engagement assembly can be moved relative  
5           to the reference position to vary the exercise of said operator.

1                   9. The apparatus of claim 8 including means selectively for moving  
2                   said carriage along the track during exercise by said operator so as to permit  
3                   selective variation in the attitude of said exercising during said exercising.

1                   10. The apparatus of claim 9 having a control system including a  
2                   control member borne by the engagement assembly and selectively engageable by the  
3                   operator to cause said selective variation in the attitude of said exercising.

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1                   11. The apparatus of claim 10 wherein said engagement assembly is  
2                   mounted for movement along a second path of travel for use in exercising and  
3                   wherein said controlling means further includes a system for resisting movement of  
the engagement assembly along the second path of travel.

1                   12. The apparatus of claim 11 wherein said controlling means further  
2                   includes means selectively for varying, from said operator's station, the amount of  
3                   resistance applied by said resisting system for resisting movement of the engagement  
4                   assembly along the second path of travel.

13. The apparatus of claim 12 wherein said resisting system is pneumatic so as to be capable of resisting movement of the engagement assembly in an environment of substantially reduced gravity.

14. The apparatus of claim 1 wherein said engagement assembly is mounted for movement along a second path of travel for use in exercising and wherein said resisting means is operably connected to said engagement assembly through a linkage selectively operable to change the resistance applied to said engagement assembly during said movement along the second path of travel.

15. The apparatus of claim 14 wherein said resisting means includes a pressurized vessel having a pressure member therein from which a linking member is extended and which, in turn, is operatively connected to the engagement assembly to resist movement of the engagement assembly along said second path of travel against pressure within said vessel and wherein said linkage operatively interconnects the linking member and the engagement assembly so as to be movable between a first position, to resist movement of the engagement assembly in a first pattern in the second path of travel, and a second position, to resist movement of the engagement assembly in a second pattern in the second path of travel.

1                   16. The apparatus of claim 15 including pressure means selectively  
2 for moving said linkage between said first and second positions.

1                   17. The apparatus of claim 16 wherein said pressure vessel and said  
2 pressure means are pneumatic cylinders.

1                   18. The apparatus of claim 5 including a second reference position  
2 disposed in spaced relation to said first reference position, a second engagement  
3 assembly mounted for movement along a path of travel relative to the second  
4 reference position and second means for resisting movement of the second  
5 engagement assembly along the path of travel thereof whereby an operator received  
6 in said operator's station can simultaneously, independently contact said first and  
7 second engagement assemblies for use in exercising.

1                   19. The apparatus of claim 18 wherein said operator's station is  
2 defined by a surface of contact for the back of an operator received in the operator's  
3 station substantially between said first and second reference positions for contact by  
4 the hands of the operator with said first engagement assembly and contact by the feet  
5 of the operator with said second engagement assembly for simultaneously exercising  
6 the upper and lower body of said operator.

1                   **20.** The apparatus of claim 19 including at least one restraint borne  
2 by said frame for attachment to an operator received in said operator's station to  
3 restrain the operator therein for said exercising in an environment of substantially  
4 reduced gravity.

1                   **21.** The apparatus of claim 20 wherein said first and second  
2 engagement assemblies are individually movable relative to said frame from stored  
3 positions substantially overlaying said operator's station to operational positions  
4 deployed for use.

1                   **22.** The apparatus of claim 20 wherein said first and second resisting  
2 means include pneumatic systems individually operable to resist movement of the  
3 first and second engagement assemblies along their respective paths of travel so as  
4 to permit exercising in an environment of substantially reduced gravity.

1           23. The apparatus of claim 22 wherein the first engagement assembly  
2         includes a pair of arms individually mounting hand grips for individual grasping by  
3         said hands of the operator and wherein at least one of said hand grips mounts at least  
4         one member engageable by a finger or thumb of the operator's hand and operably  
5         connected to at least one of said pneumatic systems and operable selectively to  
6         increase or alternatively decrease the amount of resistance applied to at least one of  
7         said first and second engagement assemblies during movement along its respective  
8         path of travel.

1           24. The apparatus of claim 20 including an electrical system  
2         connected in information receiving relation to said pneumatic systems and a display  
3         assembly operable to display indicia for observation to convey said information  
4         received by the electrical system.

1           25. An exercising apparatus operable to permit exercising by an  
2         operator selectively through a range of exercising movements during substantially  
3         continuous exercising, the apparatus comprising:  
4  
5           A. a frame having a contact surface defining an operator's  
6           station adapted to receive an operator in a supine attitude  
7           with the operator's upper body adjacent to a first end  
8           thereof and the operator's lower body adjacent to an  
            opposite second end thereof;

- 9                   B. a track mounted on the frame adjacent to said first end  
10                  thereof defining a first path of travel substantially aligned  
11                  and offset relative to the first end of the operator's  
12                  station;
- 13
- 14                  C. a carriage borne by the track for movement along the  
15                  first path of travel;
- 16
- 17                  D. a pair of arms mounted on the carriage for individual  
18                  substantially pivotal movement along a pivot axis  
19                  substantially right-angularly related to the first path of  
20                  travel under the impetus of an operator received in said  
21                  supine attitude in the operator's station; and
- 22
- 23
- 24
- 25                  E. a pneumatic system individually operably connected to  
26                  the carriage and the arms of said pair of arms selectively  
27                  operable to move said carriage to a selected position  
28                  along the first path of travel and to resist said individual  
29                  substantially pivotal movement of the arms of said pair of  
30                  arms about said pivot axis for purposes of exercising the  
                        upper body of the operator through a range of exercising  
                        movements.

1                   **26.** The apparatus of claim 25 including a pair of control members  
2 mounted on at least one of the arms of said pair of arms, one of which is operable  
3 to operate the pneumatic system to move said carriage to a selected position along  
4 the first path of travel and the other of which is operable selectively to increase or  
5 alternatively to decrease the amount of resistance applied to resist said individual  
6 substantially pivotal movement of the arms of said pair of arms whereby the operator  
7 can individually selectively control the amount of resistance to said exercising and  
8 said range of exercising movements.

1                   **27.** The apparatus of claim 26 wherein said track is arcuate and is  
2 mounted on the frame beneath said upper end of the operator's station substantially  
3 concentric to the shoulders of the operator in said supine attitude.

1                   **28.** The apparatus of claim 26 including

2                   F. a pair of leg members mounted on said frame adjacent to  
3                   said second end portion for individual substantially  
4                   pivotal movement along a pivot axis substantially right-  
5                   angularly related to the operator's station under the  
6                   individual impetus of the feet of an operator received  
7                   in said supine attitude in the operator's station.

1                   29. The apparatus of claim 28 wherein said pneumatic system is  
2                   individually operably connected to the leg members of said pair of leg members to  
3                   resist said individual substantially pivotal movement of the leg members of said pair  
4                   of leg members about said pivot axis for purposes of exercising the lower body of  
5                   the operator.

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1                   31. The apparatus of claim 30 including at least one restraint borne  
2                   by said frame for attachment to an operator received in said operator's station to  
3                   restrain the operator therein for said exercising in an environment of substantially  
4                   reduced gravity.

1                   32. The apparatus of claim 30 wherein the arms of said pair of arms  
2 and the leg members of said pair of leg members are individually moveable relative  
3 to said frame from retracted positions substantially overlaying said operator's station  
4 to extended positions constituting the respective termini of individual paths of pivotal  
5 movement of the arms of said pair of arms about the pivot axis thereof and of  
6 individual paths of pivotal movement of the leg members of said pair of leg members  
7 about the pivot axis thereof whereby said arms of said pair of arms can be disposed  
8 in their respective retracted positions and the leg members of said pair of leg  
9 members disposed in their respective retracted positions so as to dispose said  
10 apparatus in a compact configuration suitable for storage.

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1                   33. The apparatus of claim 32 including an electrical system  
2 connected in information receiving relation to said pneumatic system and an electrical  
3 display assembly deployed for observation and wherein said display assembly is  
4 operable to display indicia graphically conveying said information received by the  
5 electrical system.

1                   34. The apparatus of claim 33 wherein said electrical display  
2 assembly is deployed for observation by said operator in the supine attitude in the  
3 operator's station for the selective operation of said first and second control  
4 members.

1                   35. The apparatus of claim 32 including an electrical system  
2 connected in information receiving relation to said pneumatic systems and an  
3 electrical display assembly mounted on an arm, in turn, borne by said frame, adapted  
4 to be deployed in an operational position for observation by said operator in the  
5 supine attitude in the operator's station and wherein said display assembly is operable  
6 to display indicia graphically conveying said information received by the electrical  
7 system for use by the operator in the operator's station for the selective operation of  
8 said first and second control members.

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1                   36. The apparatus of claim 35 wherein said arm on which the display  
2 assembly is mounted is mounted on the frame for substantially pivotal movement  
3 from the operational position to a retracted position overlaying said operator's station  
4 in said compact configuration suitable for storage.

1                   37. The apparatus of claim 35 wherein said electrical display  
2 assembly includes a display screen visible to the operator in said operational position  
3 and including a screen operable graphically to display said indicia in substantially  
4 discrete display areas, a first of which is substantially centrally disposed on the  
5 display screen and a second of which is substantially peripherally disposed relative  
6 to the first display area.

1           38. The apparatus of claim 37 wherein said first display area is  
2           adapted graphically to display indicia revealing said operator's performance as  
3           received from the pneumatic system by the electrical system and wherein said second  
4           display area is adapted graphically to display indicia providing instructions to said  
5           operator for operation of the apparatus.

1           39. The apparatus of claim 38 wherein said second display area  
2           displays indicia instructing said operator on the operation of said first and second  
3           pairs of control members for operation of the apparatus and including instructions on  
4           operation of the first display area.

1           40. The apparatus of claim 39 wherein said first display area has at  
2           least two modes of operation, one of which displays indicia relating to the strength  
3           applied by the operator in the operation of said arms of said pair of arms and the  
4           other of which displays indicia relating to the force exerted by the operator as it  
5           relates to the cardiovascular benefits to said operator.

1           41. The apparatus of claim 39 wherein said first display area has at  
2           least two modes of operation, one of which displays indicia relating to the strength  
3           applied by the operator in the operation of said leg members of said pair of leg  
4           members and the other of which displays indicia relating to the force exerted by the  
5           operator as it relates to the cardiovascular benefits to said operator.

1                   **42.** The apparatus of claim 40 or 41 wherein said second display area  
2 displays indicia instructing said operator on how to change the indicia displayed in  
3 the first display area between said first and second modes of operation.

1                   **43.** The apparatus of claim 32 wherein the arms of said pair of arms  
2 and the leg members of said pair of leg members at said respective termini of the  
3 individual paths of pivotal movement define a distance therebetween approximating  
4 the length of said operator's body in the supine attitude.

1                   **44.** The apparatus of claim 43 wherein the length of said apparatus  
2 in the compact configuration is less than the length of said operator's body in the  
3 supine attitude.

1                   **45.** The apparatus of claim 44 wherein the height of said apparatus  
2 in the compact configuration is less than four times the thickness of the operator's  
3 body in the supine attitude.

1                   46. The apparatus of claim 32 wherein the resistance applied by the  
2                   pneumatic system to said individual substantially pivotal movement of the arms of  
3                   said pair of arms and the leg members of said pair of leg members is within a range  
4                   adapted substantially to duplicate corresponding pneumatic resistance applied in a  
5                   magnitude of gravity equivalent to that on the surface of the planet earth even though  
6                   the apparatus is in an environment having a gravity different from that on the surface  
7                   of the planet earth.



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